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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Application No.: 09/747,370

Attorney Docket: DP-303157

Filing Date: 12/21/2000

Applicant: William J. LaBarge et al.

Group Art Unit: 1764

Examiner: Tran, Hien Thi

Title: CATALYST SUBSTRATE HAVING IMPROVED THERMAL DURABILITY

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**APPEAL BRIEF**

Sir:

Further to the Notice of Appeal filed March 24, 2005, Applicants herewith respectfully present their Brief on Appeal.

The Commissioner is hereby authorized to charge any fees associated with the filing of this Appeal Brief to Deposit Account No. 50-0831.

**I. REAL PARTY IN INTEREST**

The real party in interest in this appeal is Delphi Technologies Inc.

**II. RELATED APPEALS AND INTERFERENCES**

There are no related appeals or interferences known to Applicants, their legal representatives, or assignee that will directly affect, be directly affected by, or have a bearing on the Board's decision in the pending appeal.

**III. STATUS OF THE CLAIMS**

Claims 15-24 are pending in the application. Claims 15-24 stand rejected. Claims 15 – 24, as they currently stand, are set forth in Appendix A. Appellants hereby appeal the final rejection of Claims 15 – 24.

**IV. STATUS OF AMENDMENTS**

Claims 15-24 were amended in an Amendment after Final Rejection, mailed February 28, 2005. The amendment has been entered, per the Advisory Action mailed March 16, 2005.

**V. SUMMARY OF THE INVENTION**

The present invention relates to a catalytic converter of the type employed for treating automotive exhaust gas. The catalytic converter 10 comprises a substrate 12 housed in a shell 14, see Fig. 1. The substrate defines a plurality of passages through

which exhaust gas flows. Catalyst, typically composed of noble metals, is dispersed on the passages for treating the exhaust gas.

The substrate is typically formed of a cordierite material. The surface of the cordierite material tends to develop microcracks that reduce the structural integrity of the substrate, page 3, lines 9-17. In conventional practice, the substrate is coated with an alumina coating that tends to fill the microcracks. However, at elevated temperatures, such as experienced during manufacture or use, the alumina tends to expand and enlarge the cracks, thereby further weakening the substrate structure, page 2, line 21, to page 2, line 3.

Applicants' invention comprises a zirconium phosphate coating applied to a cordierite substrate to fill the microcracks. Applicants have found that the zirconium phosphate coating possesses a crystalline structure and a coefficient of thermal expansion that allows it to expand at elevated temperatures without enlarging the microcracks, page 9, lines 1-11. As a result, the structural integrity and thermal durability of the substrate is substantially improved.

It is an advantage of Applicants' invention that the substrate is formed of cordierite, a material preferred in the industry for such substrates, page 8, beginning at line 20. By improving the durability of cordierite, the need for exotic alternate materials is avoided. Also, it is common to add zirconia to cordierite material used to form the substrate, which results in improved bonding between the substrate and the coating. It is a further advantage that the zirconium phosphate coating may be applied by conventional

techniques, and without having to resort to more costly processes, page 9, beginning at line 12.

## **VI. ISSUES**

1. WHETHER CLAIMS 15-17 and 20-22 ARE ANTICIPATED UNDER 35 U.S.C. § 102(e) BY, OR OBVIOUS UNDER 35 U.S.C. § 103 OVER, UNITED STATES PATENT NUMBER 6,375,910, TO DEEPA ET AL.?

## **VII. GROUPING OF CLAIMS**

Claims 15-17 and 20-22 stand rejected under 35 U.S.C. § 102(e) as anticipated by United States Patent No. 6,375,910, issued to Deepa et al. in 2002. Claims 18-19 and 23-24 were rejected under 35 U.S.C. § 103 as unpatentable over Deepa et al.

It is believed that, for purposes of this appeal and as distinguished over the Deepa et al reference, all claims may be grouped together for consideration.

## **VIII. ARGUMENT**

Applicants' catalytic converter comprises a cordierite substrate having an applied zirconium phosphate layer.

Deepa et al. is directed to a multi-zoned catalytic trap for adsorbing, releasing and treating NO<sub>x</sub>, col. 3, lines 50-51, and col. 4, lines 58-63. For this purpose, NO<sub>x</sub> sorbent

may be applied as a washcoat to a carrier member, col. 6, beginning at line 10. Deepa et al. teaches that the carrier member may be cordierite or the like, col. 6, lines 37-38, and col. 7, lines 7-8. Beginning at col. 7, line 3, Deep et al. teaches a method for manufacturing the trap that includes applying a washcoat of fine particulate refractory oxide, e.g., activated alumina, col. 7, lines 9-10. Deep et al. does not describe a washcoat containing zirconium phosphate, as in Applicants' invention.

The rejection points to the disclosure at col. 8, lines 41-52. As stated at the beginning of the paragraph, the cited text is directed to alternate refractory materials for the carrier. The text does not mention or apply to the washcoat. Zirconium phosphate is listed as a typical refractory material for the carrier. The list also includes refractory metals, including stainless steel, iron/chromium alloy or titanium. The practitioner would readily appreciate that such metals are not suited for use in washcoats, and that the list is intended to mean carrier materials, not coating materials.

Moreover, nothing in col. 8, or anywhere else in Deepa et al., is concerned with microcracking of the carrier surface. Deepa et al. does not point to the coefficient of thermal expansion and other properties that allow zirconium phosphate to fill microcracks in the cordierite, but not expand when heated to elevated temperatures, so as to enhance the structural integrity and thermal durability of the substrate, see page 9, lines 6-11. Without these features, Deepa et al. does not anticipate, or even suggest Applicants' invention.

Claim 15 is directed to Applicants' catalytic converter that includes a substrate comprising cordierite and a zirconium phosphate layer disposed on the substrate. Deepa et al. particularly points to cordierite, but lists other suitable metals and ceramics. However, Deepa does not disclose a coating that contains zirconium phosphate. Moreover, Deepa et al. does not disclose that a zirconium phosphate coating fills microcracks in the cordierite and extends the useful life of a cordierite substrate. Therefore, Deepa et al. does not teach, or even suggest, Applicants' invention in claim 15.

Claims 16-19 are dependent upon claim 15 and so not taught or suggested by Deepa et al. at least for the reasons set forth with regard to that claim. It is noted that in claim 16, the substrate also includes zirconia. As described at page 9, lines 12-13, bonding of the zirconium phosphate coating is enhanced by the addition of zirconia in the cordierite, a further feature not taught or suggested by Deepa et al. .

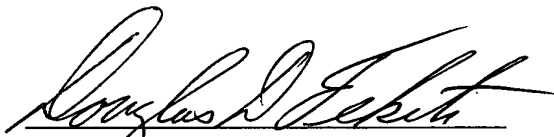
Claim 20 is directed to Applicants' catalyst substrate that includes a cordierite substrate material and a zirconium phosphate layer disposed thereon. For the reasons set forth above, Deepa et al. does not show a cordierite substrate material having a zirconium phosphate layer, and so does not teach or suggest Applicants' catalyst substrate in claim 20, or claims 21-24 dependent thereon.

Accordingly, it is respectfully requested that the rejection of the claims 15-24 based upon Deepa et al. be reconsidered and withdrawn, and that the claims be allowed.

**IX. CONCLUSION:**

In summary, claims 15 – 24 are not anticipated by and are non-obvious over Deep et al. For the reasons cited above, Applicants respectfully submit that all of the claims are allowable and the application is in condition for allowance. Applicants respectfully request reversal of the outstanding rejections and allowance of this application.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Douglas D. Fekete", is written over a horizontal line.

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**APPENDIX A**  
**CLAIMS**

1-14. (Canceled)

15. (Previously Presented) A catalytic converter, comprising:  
a substrate comprising cordierite;  
a zirconium phosphate layer disposed on said substrate;  
a catalyst layer disposed on said zirconium phosphate layer; and  
a shell disposed around said substrate.

16. (Previously Presented) The catalytic converter of Claim 15,  
wherein the substrate further comprises zirconia.

17. (Previously Presented) The catalytic converter of Claim 15,  
wherein said catalyst layer comprises a catalyst material selected from the group  
consisting of platinum, palladium, rhodium, iridium, osmium, ruthenium, tantalum,  
zirconium, yttrium, cerium, nickel, copper, and oxides, mixtures, and alloys comprising  
at least one of the foregoing.



18. (Previously Presented) The catalytic converter of Claim 15, wherein said zirconium phosphate has a thickness of up to about 10 nanometers.

19. (Previously Presented) The catalytic converter of Claim 18, wherein said thickness is up to about 4 nanometers.

20. (Previously Presented) A catalyst substrate for use with a catalytic converter, comprising:

a substrate material comprising cordierite;

a zirconium phosphate layer disposed on said substrate material; and

a catalyst layer disposed on said zirconium phosphate layer.

21. (Previously Presented) The catalytic converter of Claim 20, wherein the substrate material further comprises zirconia.

22. (Previously Presented) The catalytic converter of Claim 20, wherein said catalyst layer comprises a catalyst material selected from the group consisting of platinum, palladium, rhodium, iridium, osmium, ruthenium, tantalum, zirconium, yttrium, cerium, nickel, copper, and oxides, mixtures, and alloys comprising at least one of the foregoing.

23. (Previously Presented) The catalytic converter of Claim 20, wherein said zirconium phosphate has a thickness of up to about 10 nanometers.

24. (Previously Presented) The catalytic converter of Claim 23, wherein said thickness is up to about 4 nanometers.

25-26. (Cancelled)